DOCUMENT RESUME

ED 160 397 SE 024 948

AUTHOR Khan, M. S.
TITLE Ornamental and Shade Tree Pest Control: A Guide for Commercial Applicators.
INSTITUTION District of Columbia Dept. of Environmental Services, Washington, D.C.; District of Columbia Univ., Washington, D.C. Cooperative Extension Services.
PUB DATE 77
NOTE 64p.; For related documents, see SE 024 946-949; Contains numerous light and broken type

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS Agricultural Chemical Occupations; *Disease Control; Herbicides; Insecticides; *Manuals; Ornamental Horticulture; *Pesticides; *Plant Pathology; Science Education; *Trees

ABSTRACT

This is a training manual for commercial pesticide applicators. It gives information for identification and control of diseases, insects, mites, weeds, and vertebrate pests of shade and ornamental trees. Phytotoxicity, environmental concerns, and pesticide application information is also given. (BE)

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pesticide applicator training manual

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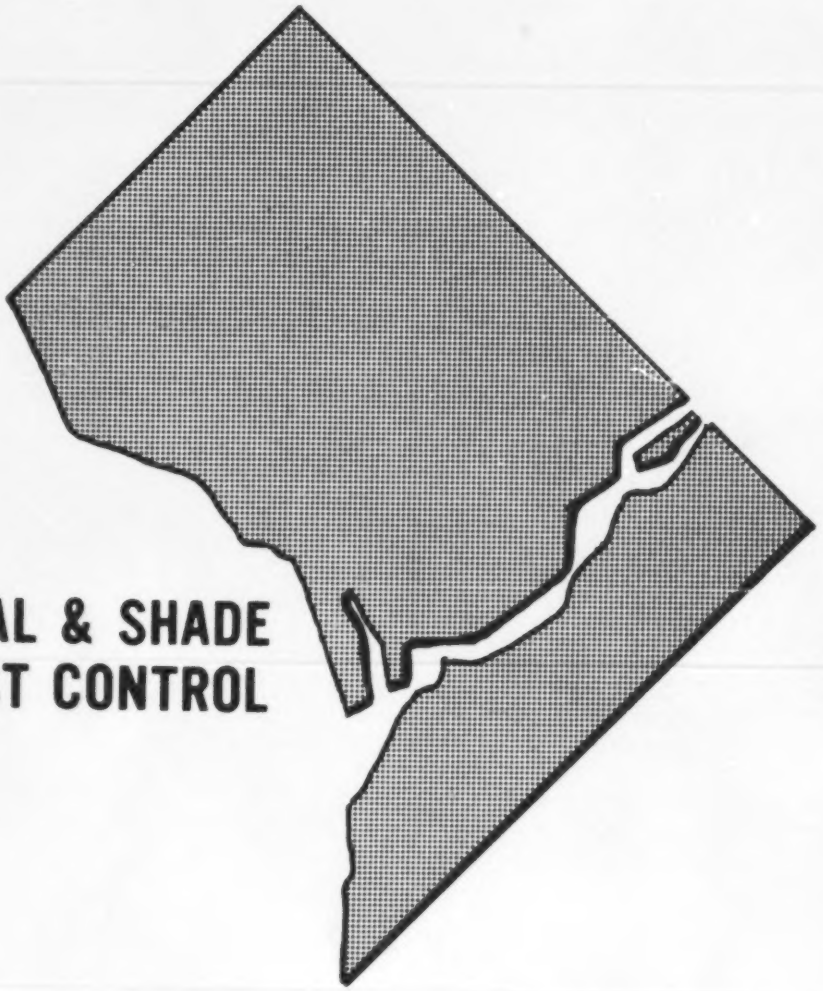

ORNAMENTAL & SHADE TREE PEST CONTROL

University of the District of Columbia
Cooperative Extension Service
1351 Nicholson Street, N. W.
Washington, D. C. 20011

1977

SE 024 948

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ORNAMENTAL AND

SHADE TREE

PEST CONTROL

[A GUIDE FOR COMMERCIAL APPLICATORS]

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Acknowledgements:

I wish to thank my colleagues, Dr. R. C. Lambe and Plant Pathologists and Entomologists from Virginia Polytechnic Institute and State University, Georgia and Clemson Extension Services, Dr. William Hoffman and staff of EPA, Dr. L. Gibbs and Mr. P. Bergman of USDA were most helpful in the preparation of this manual.

The assistance of Mr. William Stanley and the typists of the D. C. Cooperative Extension Service and Ms. Essie L. Willis of Washington Technical Institute were invaluable.

My gratitude to Mr. W. B. Easley for his help on the administrative aspects in the preparation of this manual.

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This training manual contains basic information to meet the standards of the Environmental Protection Agency for the certification of pesticide applicators. It prepares you for an examination of category A and subcategory 1, given by the Department of Environmental Services, the Lead Agency.

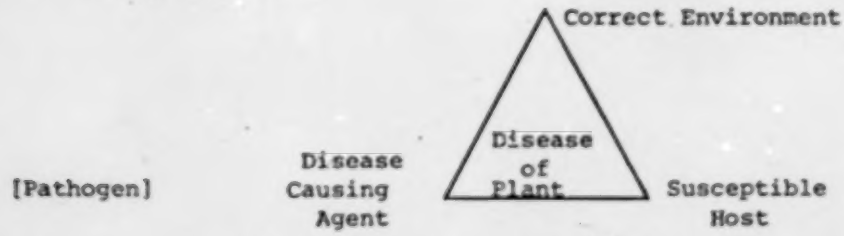
This manual will not furnish you with all the knowledge for ornamental, and shade tree pest control. Any additional information can be obtained from the Plant Pathology Division, Cooperative Extension Service of the District of Columbia. Lectures, short courses, publications, and other educational materials will supplement this manual.

For further information call 282-7403 or write to D. C. Cooperative Extension Service, 1351 Nicholson Street, N. W., Washington, D. C. 20011.

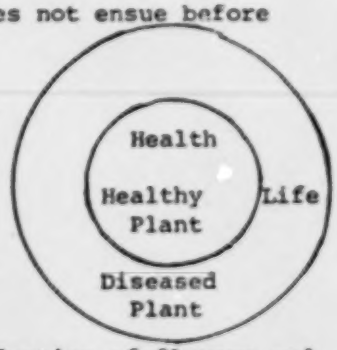
INTRODUCTION

Disease

A disease is an abnormal (physiological) condition expressed (seen) in the form of symptoms. For a plant disease to occur three conditions must be met namely, the disease causing agent, the proper environment and a susceptible host.



A disease plant can also be beyond the sphere of health but within the sphere of life providing death does not ensue before corrective measures are applied.



When the normal functions as growth production of flowers and fruits are hampered (disrupted) we say the plant is diseased, that is, the plant is not healthy or it is sick.

One or more organisms can produce a disease namely, fungus, bacterium, virus, menatode (eelworm), insect and other animals. Climatic, physiological and mechanical factors also cause disease

Some Common Diseases of Ornamentals and Shade Trees:

Leaf spots:

Leaf spots are the most common plant disease seen as brown or white center with a darker margin or as dead (necrotic) lesion; if these join up together they will look like a blight or a blotch. Scorch on the other hand is often used to describe the sun's effects on plants but can also be caused by fungi. Anthracnose spot, anthracnose and black spot are also leaf spots. Fungi, bacteria and other environmental factors cause leaf spots. Wet seasons seem to favor their development.

Leaf blight:

Injured or diseased leaves result in withering, cessation of growth and death: Leaf and fruit damage are sudden. The twigs and branches die back with the dead foliage still clinging on.

Canker:

A canker is a localized lesion on woody plants. It is caused many times by wounds, the results of which are shrunken and dead tissues which later crack open and expose the woody tissues to infection. The canker may affect stems, canes, or tree trunk thus disrupting the water conducting tissues and as a result the tips of branches die back.

Galls

Galls are swellings (tumors) where cells increase (hyperplasia) in plant tissues due to many causes including stimulation from insects, bacteria, fungi viruses, nematodes and other factors.

Wilts:

A (deficiency) lack of water from leaves and stems causes temporary or permanent wilt. The latter type can also be caused by disease organisms like fungi, bacteria or injury by the elements or machanical. Organisms enter the plant through the roots and move up the stems thus blocking the conducting tissues (vascular system). When a pathogen (disease causing organism) is involved, wilts are difficult to control as the invasion is internal. Organisms might produce toxins (poisons) to kill the cells and eventually account for rots of roots and stem bases. Externally there will be sudden wilting and dying of leaves which may be reduced in size.

Internally discoloration of all roots can be seen depending on the organism.

Rots:

A rot is a decay and disintegration of plant tissues which can be dry or soft. The organisms can affect the rhizome, stem, tree truck, fruits and blossoms. Many of these have a foul smelling effect. Rots of leaves are described under leaf spots and blights.

Mildews:

There are 2 kinds of mildews.

a. Downy Mildews also known as false mildews, invade the plants deeply and bear spores which can be seen on the plant surface. They make gray, white or violet patches on the leaves. These can best be seen, after cloudy, moist nights, on plants that are wind protected.

b. Powdery mildews grow on top (superficially) of leaves and stems forming a layer. Some fungi produce black soot, others gray or white. These mildews thrive in rainy season with cold nights and warm days, where plants are crowded or planted in shady areas. These mildews must have a living plant (host) on which to feed but can overwinter on dead leaves and stems. The fungus (sucks) depletes the plant sap thus causing stunting dwarfing and deformed flower buds.

Rusts:

Rusts belong to the same group of fungi as the mushrooms but rusts can only survive on their living hosts' plant tissues. Many of them complete their life cycle on one kind of plant (Asparagus rust) while others need two kinds of plants to have a full life cycle (cedar-apple rust).

Rusts symptoms are identified from others by the presence of rust-colored spores in powdery clusters or gelatinous horns, which are yellow.

Smuts:

Smuts are named after their sooty black spore masses. Many enter the plant in the seedling stage and travel inside (systemically) until blossom time. Other are localized.

Sooty Mold:

Sooty mold is a black coating on surfaces of leaves and fruits. They live on the honey dew of insects and harm the plants indirectly.

Gummosis:

Gummosis is the exudation of sap (including latex or gum) to the surface. This may be due to attack by an organism, injury, etc. Attack on the crown can produce oozing on the trunk and branches.

Mosaics:

Mosaics or mottling of the leaves can be the result of viral and related organism infection. These patterns are light and dark areas. Leaves may curl and the entire plant looks abnormal.

Chlorosis:

Chlorosis is yellowing or whitening of normally green tissue due to partial failure of chlorophyll (green color in plant) to develop. May be due to virus or nutrient deficiency e.g. iron, manganese, zinc, nitrogen, boron, magnesium or poor aeration in a water-logged soil.

Damping-off

Damping-off fungi attack seedlings killing the tissues of stems and roots at soil level the effects of which cause the plants to fall over. Some fungi in this category attack the seeds before they emerge from the soil while others produce rot and wilts after plants emerge. Plants with soft stems look water-soaked, then die and fall over; plants with woody or hard stems wilt and remain upright but the roots rot.

OEDEMA

Small masses of tissue may expand and break out on the surface resulting in a watery swelling or galls. This condition can be observed when there is an unbalance between plant and water, especially at times of high humidity.

This non parasitic or physiological situation should not be confused with hurt lesion caused by a fungus.

WITCHES' BROOM

Witches' broom describes the development of a large number of accessory shoots. In some plants, these symptoms are produced by mycoplasma like organism, in others fungi cause witches' broom and affect plants systemtically, roots, crown, stem and leaves or can appear as birds' nests or overgrowth.

Nutrition:

Plant diseases are caused by other factors as well. Plants need the major elements, nitrogen, phosphorus and potassium (NPK) and one or more of the minor elements, magnesium, calcium, iron, boron, zinc, manganese etc. When a plant is deficient in an element, symptoms in leaves, for example, will show up as yellowing with green veins.

Chemical Injuries:

Imbalances of fertilizer application can be detrimental. Care should be exercised in applying fertilizers, weed killers and other chemicals. Salt used in winter can injure tree roots along the highways and paths. Pollutants as sulfur dioxides, nitrous oxides, fluorides and smog are also harmful. Solid residues of smoke and soot damage plants too.

Spray Injuries:

Injuries occur when too much fungicides and insecticides are applied. Some pesticide chemicals are safer than others and some are incompatible with others. Timing and choice of chemicals are important.

Gas Injuries:

Fumigants can injure many plants, for example, mercury bi-chloride injure roses in the green house, where-as paints on green houses release phenyl mercury and injure plants. Gas mains leak and injure roots. Hydrogen cyanide, carbon monoxide, ethylene, acetylene, butylene and propylene are injurious.

Lightning Injury:

Damage varies in the U. S. Trees can be split, branches scorched, part or whole tree can be destroyed. Lightning damaged trees will show sudden wilting and drying leaves. Protect tall trees by grounding with copper cables. Electricity of other sorts affect trees and shrubs and the one that comes to mind is the use of outdoor Xmas lights.

Mechanical Injury:

Mechanical injuries are caused by hails, sleet, snow, rains mowers, cuts, vehicle damage, ropes, wires and so forth.

Sunscorch and Heat:

Injuries can be seen on plants in winter and summer.

Winter Injury:

Severe winter conditions or drastic freezing and thawing, cold winds and hails are damaging to plants.

Insects, Mites, and other Pests of Ornamentals, Vines and Trees.

It is important to be able to identify the insects and mites which are harmful to plants since there are more than 2000 species on woody plants alone. Some are found in this area all the time and cause much damage while others which are brought in (introduced) or found occasionally do not create a problem at the present time.

The most important and common insects and mites are aphids, borers, vine weevils, leaf-hoppers, scale insects, lace bugs, leaf miners, defoliators, skeletonizers and sawflies. There are several species of each of these and what is most interesting is the fact that many are named after their hosts.

Most of us do not know one bug from another, therefore, we consider all as harmful. When a damage is observed we apply chemicals disregarding the thought of first identifying or differentiating the harmful from the beneficial ones.

Many insects have 3 to 4 stages in their development but only 1 or 2 stages may be the damaging ones. Moths and butterflies do damages only in larval or worm stage. Some beetles, like the Japanese beetle are destructive in larval and adult stages. So, if we are able to identify the pest, we can check if they are destructive or not. At the same time it is important to be able to detect an early infection.

Brief description of some of the common pests:

APHIDS:

Nearly all types of flowers, shrubs, vines and trees are attacked by these. They have sucking mouthparts and are found on young growing parts of plants. Injured cells fail to develop and the expanding leaf or bud is crinkled, and distorted with galls. Plants look stunted. These insects also transmit diseases. They secrete a honey dew on which develops a sooty mold. These insects can produce living young ones as well as eggs which overwinter on buds and hatch in spring. Average life span is 20 - 30 days. Insects can reproduce 6 - 10 young ones when at 7 - 8 days old.

Beetles, Borers, and Vineweevils:

There are beneficial and harmful ones. Do not destroy the lady bird (lady bug) or black ground beetles. They feed (are predaceous) on aphids, grubs and others. The most destructive ones on ornamentals and trees are blister-beetle, flea-beetle, bean-leaf beetle, striped and spotted cucmber beetles, colorado beetle, japanese beetle and the elm leaf beetle. Insects are usually covered with a heavy coat of hornlike material and have the wing covers of the same hard coat. They are of many different colors, sizes and shapes and have chewing mouth parts. They feed on all sort of plants, occur under bark, living, dying and dead plants, found on or in the ground, in fungi, rotting vegetation or dug. Some live in water while others attack wood and wood products.

Caterpillars Cutworms and Worms:

Most of these are larvae of moths and butterflies. They are in all sizes, colors, naked or hairy, with or without tufts or spines. They all feed on foliage and many make silk or web. Their names are coined after their appearances, hosts, and how they live for example, leaf rollers, bag worms, hornworms, pickleworms, leaf skeletonizers, etc. Many moth larvae hatch from eggs laid on grass or weeds. They burrow underground and feed at night. In winter they go underground to pupate and in summer the adult moths emerge.

Lace Bugs:

Lace bugs are "true bugs," small 1/16 - 1/8." Nymphs and adults crown lower leaf surfaces, suck sap and leave black specks. The upper surfaces are pale, speckled, blotched then white and brown.

Leafhoppers:

There are about 2000 species, small 1/8" - 1/2" long, wedge-shaped with piercing-sucking mouth parts. They feed on all kinds of plants and trees sucking sap from the underside of leaves which will lose color, become stippled, wilted and weakened. Some species inject toxic substances as they feed thus causing the wilting. Leafhoppers also transmit plant viruses.

Leafminers:

The larvae of moths crawl between leaf surfaces and produce irregular patterns. These includes both the beetle and moth families.

Lygus Bug:

This includes the tarnished plant bug, causing growing tips to wilt,

prevent opening of buds and promote side branch development below injury. Adults are 1/5" long, color is brown with yellow and black dashes but varies. They hide under leaves. Their triangular head tops the oblong shaped body. Adults winter in rubbish and breed in spring when it is warm. Young nymphs hatch from eggs laid in flower heads and appear similar to aphids. All stages cause injury and a complete life cycle occurs in a month.

Mealy Bugs:

Related to scale insects. They have soft segmented bodies up to 1/4" long, covered with powdery white wax and look like cotton wool. They can be single or in groups on twigs and in crutches on the underside of branches. They suck sap and secrete a sticky honey dew. These insects attack the inner portions (center) of plants, hide and go unnoticed until the leaves and needles become pale, wilt and a part or all of the plant dies.

Mites

Mites are not really insects but are classed with spiders, ticks and scorpions. They injure plants by sucking sap from lower leaf surfaces, while the top surfaces become pale or yellow with tiny yellow specks. They produce a web for protection. Look for web, specks of dark excrement, discarded outer coats and the mites themselves. The red and 2-spotted spider mites are most common.

Scales:

Scales are divided into two groups, (a) armored and (b) soft.

(a) Armored scales live beneath an outer shell of molted skins and waxy secretions.

(b) The soft scale shell is part of the scale, like that of turtle but it is truly hard. Soft scale usually secretes honey dew (as with aphids) thus encouraging black sooty and sticky drippings on cars and walks.

A scales' mouth is a needle-like tube which uncoils 6 - 7 times as long as the body, plunging deep into the plant tissue to suck juices. Foliage looks pale, leaves and needles drop prematurely. Branches may be killed or the entire tree or shrub may die.

Armored Scales:

1. Oyster shell scale - attacks twigs and branches of fruit trees, dogwood, ash, viburnum, birch, poplar.
2. Euonymous Scale - on leaves and stems of enonymous, bittersweet and ground covers.
3. San Jose' scales attacks bark and fruit of fruit trees, pyracantha, cotoneaster, dogwood, elm, ash, etc.
4. Pine Needle Scale - on needles of pines, blue spruce, hemlock, fir and cedar.

5. Scurfy scale - on plants' shaded parts, with scurfy appearance on bark. Also on foliage and fruit. Plants attacked are dogwood, hawthorn, elm, ash, willow, aspen, maple and hickory.
6. Juniper scale - branches turn dingy gray or yellowish before scale is seen.

Soft Scales:

1. Lecanium, Fletcher, Terrapin scales; large shiny brown scales on yew, arborvitae pachysandra, fruit trees, tulip tree, hickory, magnolia, oak, etc.
2. European Elm Scale: Encrusts bark in forks and crutches.
3. Cottony Maple Scale: Look for large egg mass on maple, boxelder and linden.
4. Tulip Tree and Magnolia Scale: Two of the largest scales.

Sawflies:

Sawflies include bees and wasps. They are not true flies but attack any flowering plant. The larvae resemble caterpillars of butterflies and moths in that the larvae have 10 or more soft fleshy legs. Butterfly and moth caterpillars have 6 jointed legs near the front of the body. Few species bore in stems, fruit, wood and leaves.

Slugs and Snails:

These are night crawling pests, found in dark, cool, moist greenhouses, gardens, hidden areas, basements, cellars, patios, etc. They feed on vegetables, flowering plants and leave a slimy deposit.

Thrips:

Young growing leaves become distorted, wrinkled and scarred; flowers are deformed and fail to open. Lower side of leaves have gray streaks, with small brown black dots. Buds can be affected. Yellowish or balck narrow long adults cause both chewing and sucking damage. To examine the flowers, shake over a white piece of paper and collect insects.

Whiteflies:

White flies suck sap of plants as aphids, thrips, mealy bugs, scales and others. The adults fly and they have a 5 week life cycle. Feeding on plants result in discoloration, wilting, stunting and heavily infested plants are sometimes killed.

Insect and Mite Control

To control insects and mites, direct the pesticide at the stage of the insect or mite that is causing the damage. In some situations, preventive use of insecticides may be necessary to protect plants from infestations. Your decision to use a preventive insecticide should be based on a previous history of infestation in your area. Your local extension agent can help to identify your pest problems and select the correct pesticide.

Nematodes:

Nematodes are microscopic worms that live in the soil and feed on roots. Some cause swellings and knots, other kill the root tips. Above ground symptoms include yellowing of foliage stunting and

general decline of plant similar to root rot symptoms. You may need to have soil and plant samples examined in a laboratory to confirm a nematode infestation.

SOME COMMON DISEASE, INSECT AND OTHER PEST PROBLEMS
OF
ORNAMENTALS, VINES AND TREES.

PLANT	DISEASE	INSECT AND OTHER PESTS
FIR (Abies)	Needle and twig blight, leaf cast rust, cankers, wood decay, shoestring root rot. (fungal)	Twig aphid, bagworms, caterpillars, spider mite, scales, wooly aphids, budworm.
MAPLE (Acer)	Anthracnose, bacterial leaf spot, leaf blister. Powdery mildews, wilt, bleeding canker, basal canker, nectria canker, ganoderma rot, sap streak, trunk decay. (fungal) Maple decline (Physiological).	Several leaf eating insects [gypsy moth, brown tail, tussock, american dagger, bagworms], tent caterpillar, green striped maple worm, leaf cutter, leaf-hopper, leaf stalk bores, bladder gall mite, aphids, box elder bug scale, twig pruner, sawfly and other borers.
HORSE CHESTNUT (Aesculus, hippocastanum)	Leaf blotch, leaf spots, powdery mildews wound rot; anthracnose, cankers, wilt and bleeding canker. (fungal) Leaf scorch (physiological)	Scale, mealy bugs, tussock moth, japanese beetle, bagworms, flat head borers.
CHINESE EVERGREEN (Aglaonema)	Leaf spots and leaf blight, anthracnose, soft rot of leaves, root and stem rot. (fungal)	Nematodes.
TREE OF HEAVEN (Ailanthus)	Wilt, shoestring root rot, leaf spots, twig blight, dieback, cankers. (fungal)	Moth, webworm, tussock moth.

PLANT	DISEASE	INSECT AND OTHER PESTS
BUGLE-WEED (Ajuga)	Crown Rot. (fungal)	
ALDER (Alnus)	Leaf curl, powdery mildew, canker, leaf rust. (fungal)	Wooly aphid, flea beetle, lace bug, psyllid.
AMARYLLIS	Leaf scorch, blight bulb rots. (fungal) Mosaic. (viral)	Bulb flies, bulb scale mite, thrips, aphids, 2-spotted mite, caterpillar, blister beetle, mealy bug, cutworm, nematode.
SERVICE-BERRY (Amelanchier)	Rust, leaf blight, fire blight, witches broom, mildews, fruit rot. (fungal)	Leaf miner, borers, blister mite, slugs, sawfly, scurfy scale.
ANDROMEDA (Pieris)	Leaf spots, dieback. (fungal)	Lace bugs, waxscales, 2 spotted mites, nematodes.
ANTHURIUM	Anthracnoses, leaf spots, spadix rot. (fungal)	Scales, mealy bugs, mites.
SNAP-DRAGON (Antirrhinum)	Rust, anthracnose, blight, gray mold, powdery mildews, wilt, root rot, crown rot, leaf spots, downy mildews. (fungal)	Aphids, leaf tier (greenhouse) caterpillars, 2 spotted mites, cyclamen mite, red and black stink bugs, moth nematodes.
COLUMBINE (Aquilegia)	Leaf spots, crown rot, root rot, rust; mosaic. (viral)	Aphids, borer, caterpillar, leaf miner.
NORFOLK ISLAND PINE (Araucaria)	Blight; crown gall (bacterial).	Mealy bugs, scales.
ASPARAGUS FERN (Asparagus)	Blight, root rot; crown gall (bacterial); yellows (physiological).	Caterpillar, thrips, beetles, fleahopper, cutworms, 2 spotted mites, scales.

PLANT	DISEASE	INSECT AND OTHER PESTS
AUCUBA	Leaf spots, gray mold, anthracnose, and wither tip (frost injury).	Yellow scale, aphid.
AZALEA and RHODODENDRON	Botrytis blotch, bud and twig blight, gray blight canker, brown rot, die black, damping off, petal blight, azalea gall, leaf spots, leaf scorch, rust, powdery mildews, shoot blight, shoestring root rot, wilt, (fungal) crown gall (bacterial) chlorosis, (physiological), salt injury, wilt.	Aphids, stem borer, leaf tier, black vine and strawbery weevils, hornet, japanese beetles, lace bugs, red banded leaf hopper, leaf miner, tip midge, mites, mealy bugs, borer, scales, thrips, whitefly, nematodes, stem girdler.
BAMBOO (Bambusa)	No disease in the North.	Aphids, bamboo scale, powder post beetle.
BARBERRY (Berberis)	Leaf spot (bacterial), anthracnose, root rots, rust, wilt; (fungal) mosaic. [viral]	Aphids, webworm, scales, nematodes.
BIRCH (Betula)	Leaf spots, leaf blisters, rusts, cankers, dieback, wood decay, mildews. (fungal)	Aphids, skeletonizers, leaf miner, borers, mite gall.
BOXWOOD (Buxus)	Canker, blight, leaf spots, root rots, (fungal) winter injury and sunscald (physiological).	Mealy bugs, scales, psyllid, leaf miner, hornet, webworm, nematodes, mite.
CACTUS (Cactaceae)	Blight crown gall (bacterial), wilts, stem rot, pad decay, slimy collar rot, soft rot; (fungal) bud fall, corky scab and glossiness (physiological).	Mealy bugs, scale, 2 spotted mites.
ELEPHANT EARS (Caladium) (Colocasia)	Tuber rot, leaf spots. (fungal)	Nematodes.

PLANT	DISEASE	INSECT AND OTHER PESTS
CAMELLIA	Spot disease, black mold, leaf gall, leaf spots, flower blight, cankers, root rot, leaf blight, (fungal) Bud drop, oedema, chlorosis, sun burn, salt injury (physiological).	Tea scale, red scale, mealy bugs, weevils, beetle, thrips, spotted cutworm, aphids, looper, whitefly, nematodes.
CANNA	Bud rot (bacterial), rust, stem rot. (fungal) Mosaic and aster yellows (viruses).	Japanese beetle, yellow wooly bear, leaf roller, leaf tier, scales.
HICKORY (Carya)	Leaf spots, canker, witches broom, powdery mildews (fungal); crown gall (bacterial).	Gall aphid, bark beetle, cigar case bearer, borer, twig girdler, june bugs, caterpillar, scales.
CATALPA	Leaf spots, powdery mildews, wilt, wood decay, twig blight, root rots. (fungal)	Mealy bugs, sphinx, midge.
CEDAR (Cedrus)	Tip blight, root rots. (fungal)	Black scale, deodar weevil.
BITTER SWEET (Celastrus, scandens)	Leaf spots, powdery mildews, stem canker (fungal); crown gall (bacterial).	Euonymus scale, aphids, 2-marked-treehopper.
HACKBERRY (Celtis)	Leaf spots, witches broom, powdery mildews, wood rot. (fungal)	Nipple gall maker, caterpillars, scales.
RED BUD (Cercis)	Cankers, leaf spots, wilts, root rots. (fungal)	2-marked-treehopper, caterpillars, scales.
FLOWERING QUINCE	Crown gall and fire blight (bacterial), brown rot, ruts, leaf spots, twig blight, cankers. (fungal)	Cotton aphids, root knots, whiteflies.

PLANT	DISEASE	INSECT AND OTHER PESTS
CHRYSANTHEMUM A. Daisy	Leaf spots, stem rots and crown gall (bacterial).	4-lined plant bug, leaf miner.
B. MUMS	Blights, fasciation, crown gall, leaf spot (bacterial). Wilt, rust, leaf spots powdery mildews, gray mold ray blight, speck, stem rot (fungal). Aster yellows, spotted wilt, yellow strap leaf, flower distortion, mosaic, stunt (viral).	Aphids, beetles, borer, caterpillars, midge, leaf miner, leaf tier, lace bug, mealy bug, thrips, cutworm, whiteflies, mites, foliar nematodes and termites.
CLEMATIS	Leaf spots and blights, stem rot, powdery mildews, (fungal); crown gall (bacterial).	Black blister beetle, borer, mites, white-flies.
COLEUS	Leaf spots, damping off. (fungal)	Mealy bugs, mites, whiteflies, nematodes.
DOGWOOD (Cornus)	Crown canker, flower and leaf blight, powdery mildew, tip blight, root rots. (fungal)	Borers, club gall, scales, leaf miner, aphid, beetle, caterpillar, leaf hoppers, leaf roller.
HAZEL NUT or FILBERT (Corylus)	Crown gall, blight, leaf spots (bacterial) Black knot, leaf spots, leaf curl, powdery mildews. (fungal)	Japanese leaf hopper, caterpillar, scales.
COTONEASTER	Leaf spots, canker and fireblight (bacterial).	Lace bugs, webworm, scales, borer, leaf blister mite.
HAWTHORN (Crataegus)	Fireblight (bacterial), leaf blight, rust, leaf spots, powdery mildews, scab. (fungal)	Aphids, borers, tent caterpillar, leaf blotch, miner, lacebugs, skeletonizers, hopper, scales, 2-spotted mites.
CRYPTOMERIA	Leaf blight, leaf spots. (fungal)	

PLANT	DISEASE	INSECT AND OTHER PESTS
CYPRESS (Cupressus)	Cankers on bark, cambium, trunk and young branches, needle blight (fungal); crown gall (bacterial).	Aphid, mealy bugs, caterpillar, bark scale.
CYCLAMEN	Tuber rot (bacterial), blight, stunt, wilt and root rot. (fungal)	Black-vine weevil, aphids, thrips, mites nematodes.
DAHLIA	Crown gall, wilt, bactericsis (bacterial), blight, posdery mildew, stem rot, wilt, smut (fungal) mosaic, spotted wilt (viral).	Aphids, corn borer, stalk borer, leaf hopper, bugs, thrips, homet, whitefly, cyclamen mite, nematodes, slugs.
CARNATION (Dianthus Caryophyllus)	Wilt, leaf spots and crown gall (bacterial). Wilt, stem rot, leaf spots, greasy blotches, rust, branch rot, storage rot (fungal). Streak mosaic, mottle, ring-spot (viral).	Cutworm, aphid, looper, caterpillar, thrips, 2-spotted mite, nematode.
DUMB CANE (Dieffenbachia)	Leaf spot (bacterial), leaf spots, anthracnose, stem and leaf rot, root and stem rots (fungal).	
HONEY SUCKLE (Diervilla)	Leaf spots, powdery mildews. (fungal)	Scales, root knot.
CORN PLANT (Dracaena)	Leaf spots, stem rots, tip blight. (fungal)	Thrips, mealy bug.
RUSSIAN OLIVE (Elaeagnus)	Leaf spots, cankers, rusts, wilt (fungal); crown gall (bacterial).	Aphids, scales.

PLANT	DISEASE	INSECT AND OTHER PESTS
HEATH (Erica)	Wilt, powdery mildew, rust (fungal) high pH (physiological).	Scales
EUONYMUS	Anthracnose leaf spots, powdery mildews (fungal); crown gall (bacterial).	Aphids, Thrips, scales.
EUPHORBIA A. Lactea	Stem rot. (fungal)	
B. Euphorbia pulcherrima (Poinsettia)	Crown gall, canker (bacterial) scab, gray mold leaf spots, root and stem rots (fungal), chlorosis (physiological).	Aphids, mealy bugs, 2-spotted mites, scales.
BEECH (Fagus)	Leaf spots, down mildews, bleeding and other cankers, leaf mottle, bark disease. (fungal)	Aphids, borers, scales, caterpillars.
FATSIA japonica		Spider mites, scales.
RUBBER PLANT (Ficus, elastica)	Anthracnose, tip blight, canker, gray mold, leaf spots (fungal); crown gall (bacterial) leaf scorch and fall, oedema, leaf spots (physiological).	Mealy bugs, scales, thrips, nematodes.
FERNS (Filices)	Anthracnose, tip blight, leaf spots and blisters, sooty mold, rust, damping-off, leaf blotch. (fungal)	Aphid, thrips, scale, mealy bugs, caterpillar, black vine weevil, white-fly, moth, snail, nematodes.
FITTONIA	Stem and root rots. (fungal)	
FORSYTHIA	Crown gall (bacterial), leaf spots and diebacks. (fungal)	4-lined plant bug, Japanese weevil, spider mite, nematode.

PLANT	DISEASE	INSECT AND OTHER PESTS
ASH (Fraxinus)	Rust, leaf spots, cankers, dieback. (fungal)	Borers, sawfly, leaf miner, flower gall, scales.
FUSCHIA	Blight, rootlet rot, rust, wilt, leaf spots (fungal); 2-spotted wilt (viral).	Aphids, beetles, mealy bugs, mites, scales, thrips, whitefly, nematode.
GARDENIA (Gardenia, jasminoides)	Canker, leaf spots, bud rot, powdery mildews, (fungal) leaf spots (bacterial) and chlorosis due to iron deficiency, bud drop, dieback (physiological).	Mealy bugs, scales, thrips, mites, nematodes.
GINKGO	Leaf spots, wood decay (fungal).	Looper, mealy bug, tussock moth, nematodes.
GLADIOLUS	Blight, soft rot, scab (bacterial), corm rot, hard rot, dry rots, leaf blight, wilt smut, leaf and flower spots, (fungal); aster yellows and petal protrusion (viral).	Aphids, thrips, mealy bug, tarnished plant -bug, white grubs, wireworms, earworms, 2-spotted mite, other mites and nematode.
HONEY LOCUST (Gleditsia)	Leaf spots, cankers, powdery mildews, rust, wood decay (fungal); witches broom.	Borer, pod gall midge, webworm, spider mite, bagworm, scale.
BABY'S BREATH (Gypsophila)	Crown gall, fasciation (bacterial) blight and damping off (fungal); aster yellows (viral).	Leaf hopper.
ENGLISH IVY (Hedera, helix)	Leaf spot (bacterial), stem canker, leaf spots, powdery mildews, scab (fungal).	Aphids, caterpillars, mealy bugs, scales, 2-spotted mite.
ROSE OF SHARON, ETC. (Hibiscus)	Leaf spots (bacterial), blights of flower and leaf, cankers, rust, (fungal). Strap -leaf, bud drop (physiological).	Aphids, Japanese beetles, weevil, scale, whitefly, foliar nematode.

PLANT	DISEASE	INSECT AND OTHER PESTS
HYACINTHS (Hyacinthus)	Yellow and soft rots (bacterial), black slime, gray mold, root rot, rust (fungal), mosaic (viral).	Aphids, mites, fly, yellow wooly bear, white grubs, Japanese beetle, stem and bulb nematode.
HYDRANGEA	Wilt (bacterial), bud blight, leaf spots, powdery mildews rust (fungal), ring spot (viral); sunscald, chlorosis (physiological).	Aphids, 4-lined plant bug, leaf tier, rosechafer, scale, mite, nematode.
SPIDER LILY (Hymenocallis)	Leaf spots, leaf scorch (fungal), tip burn (physiological).	Snow scale, thrips.
HOLLY (Ilex spp.)	Tar spot, leaf spots, cankers, twig blight, spot anthracnose, leaf rot and drop, powdery mildew (fungal); blight (bacterial), spine spot, leaf scorch (physiological).	Leaf miner, bud moth, beetles, whitefly, midge, red mite.
MORNING GLORY (Ipomoea)	Canker, leaf spots, rusts. (fungal)	Cotton aphids, beetles, leaf cutter, wolly bear, leaf miner, 4-lined plant bug, whitefly fleahopper.
IRIS	Soft rot, leaf spot (bacterial). Blossom blight, leaf spots, rust, rhizome rot, crown rot, black rot, ink spot, basal rot (fungal), mosaic (viral).	Leaf and bulb aphids, fly, borer, red scale, thrip, bud moth, weevil, caterpillar, grubs, and stem, bulb and root knot nematodes.
WALNUT and BUTTERNUT (Juglans spp.)	Leaf spots, yellow leaf blotch, cankers dieback, trunk decay (fungal) blight (bacterial).	Aphids, caterpillar, lace bugs, scales, mites.

PLANT	DISEASE	INSECT AND OTHER PESTS
RED CEDAR (Juniperus, virginiana)	Twig blight, cedar - apple rust, wilt, (fungal); ice, snow, electricity (physiological).	Aphid, bagworm, midge, scale, webworm, bark beetle, 2-spotted mite.
KALANCHOE	Crown rot, wilt, leaf spots, powdery mildews (fungal).	Scales.
MOUNTAIN LAUREL (Kalmia, latifolia)	Leaf spots, blight, flower blight (fungal) chlorosis (physiological).	Whitefly, lace bugs, stem borer.
PALM (Kentia)	Leaf spots and blight (fungal).	Japanese beetles, borers.
GOLDEN CHAIN (Laburnum)	Leaf spots, twig blight (fungal) vein-mosaic (viral).	Aphids, mealy bugs.
CRAPE MYRTLE (Lagerstroemia)	Powdery mildews, black spots, tip blight, root rot. (fungal)	Aphids, wax scale.
LARCH (Larix)	Cankers, leaf cast, needle rust, wood decay. (fungal)	Case bearer, sawfly, aphid, gypsy moth, tussock moth.
SWEET PEA (Lathyrus, odoratus)	Anthracnose, black root rot, downy and powdery mildews, leaf spots, white mold (fungal); fasciation, crown gall, streak leaf spots (bacterial); spotted wilt, mosaic (viral); bud drop (physiological).	Aphids, leaf-tier, earworm, 2-spotted mite, saw bugs, root nematode.
PRIVET (Ligustrum)	Anthracnose, twig blight, leaf spots, galls, powdery mildews, root rots (fungal) variegation (viral).	Aphid, leaf miner, scales, thrips, mealy bugs, japanese weevil, mites, sawfly, nematodes.

PLANT	DISEASE	INSECT AND OTHER PESTS
LILY (Lilium)	Soft rot (bacterial), gray mold, foot rot, soft bulb rot, stem canker, rust (fungal) mosaic, rosette (viral); chlorosis, leaf scorch, frost injury bud blast (physiological).	Aphid, rose beetle, weevil, stalk borer, thrip, mite, bulb leaf and root lesion nematodes.
TULIP TREE (Liriodendron)	Cankers, leaf spots, powdery mildews, root and stem rots, wilt, sap streak (fungal); leaf yellowing (physiological).	Aphid, scale, spot gall.
HONEY SUCKLE (Lonicera)	Leaf blight and spots, powdery mildews, rusts (fungal); crown gall (bacterial).	Aphids, sawfly, 4-lined plant bug, hopper, whitefly, looper, mealy bug, scale.
MAGNOLIA	Black mildews, leaf blight, leaf spots, dieback, nectria canker, leaf scab, wood decay, (fungal); algae.	Scales, mealy bug, whitefly.
CRAB APPLE (Malus spp.)	Blight (bacterial), rust, scab, canker (fungal).	Cicada, red mite.
CHINA-BERRY (Melia)	Leaf spots, limb blight, powdery-mildews. (fungal)	Scale, spider mite, whitefly.
MULBERRY (Morus)	Blight (bacterial), leaf spots, cankers, mildews. (fungal)	Hopper, borer, scale, 2-spotted mite.
NARCISSUS	Blue mold rot, crown rot, dry rot, basal rot, leaf scorch, and spots, root rot (fungal); yellow stripe, mosaic, flower streak, white streak (viral).	Bulb aphid, mites, fly, millipedes and stem, bulb and root lesion nematodes.

PLANT	DISEASE	INSECT AND OTHER PESTS
LOTUS (Nelumbo)	Alternaria anc Cercospora leaf spots. (fungal)	Aphids, japanese beetle.
PRICKLY PEAR (Opuntia)	Anthracnose, charcoal spot, dry and soft. rots (fungal), sunscald (physiological).	Fruit gall midge.
ORCHIDS (Orchidaceae)	Soft and brown rots (bacterial). Anthracnose, black rot, leaf blight, leaf spots, basal rots, root rot, petal blight, rust, wilt (fungal); flower break, mosaic (viral).	Aphids, bulb borer, fly, midge, weevil plant bug, scale thrip, mite, blotch, slugs and nematodes.
PACHYSANDRA	Leaf blight (fungal).	Leaf tier, scale, mite, root knot nematode.
PEONY (Paeonia)	Botrytis blight, leaf spots, downy mildews root rot, stem rot, wilt (fungal); ring spot, leaf curl, elongation (viral), bud blast, oedema (physiological).	Ants, japanese beetle, rose chafer, leaf beetle, scale, flower thrips, fall webworm, and root nematode.
BOSTON IVY AND VIRGINIA CREEPER (Parthenocissus)	Canker, mildews, leaf spots, wilt, anthracnose, root rot. (fungal)	Beetles, leaf hoppers, scale, aphids.
PASSION FLOWER (Passiflora)	Leaf spots. (fungal)	Caterpillars, mealy bugs, scales.
GERANIUM (Pelargonium)	Leaf spots, crown gall, fasciation (bacterial); leaf spots, blackleg, black stem rot, blossom blight, root rot (fungal) oedema, dropsy and spindly growth (physiological).	Aphids, caterpillars, mealy bugs, 4-lined plant bug, mites, scales, slugs, black-vine weevil, whitefly, subterranean termite and root knot nematode.

PLANT	DISEASE	INSECT AND OTHER PESTS
AVOCADO (Persea)	Anthracnose, root rot, scab, cankers (fungal); oedema (physiological).	
PETUNIA	Wilt (bacterial), crown and stem rots (fungal), yellows (viral).	Beetles, slugs, bugs, caterpillars, root nematode.
MOCK ORANGE (Philadelphus)	Canker, leaf spots, sooty blotch, powdery mildews, rust. (fungal)	Aphids, leaf miner, nematode.
PHILODENDRON spp.	Leaf spots (fungal and bacterial); several physiological ones.	nematodes, spider mites.
PHLOX	Leaf spots, powdery mildews, rusts, crown rots, stem blight (fungal) crown gall (bacterial); yellows (viral).	Leaf blight, beetle bugs, 2-spotted mite, bagworm.
SPRUCE (Picea)	Cankers, needle cast and rusts, wood decay. (fungal)	Gall aphids, bud worms and scale, needle miner, sawflies, pine-weevil, spider-mite, bagworm.
PINE (Pinus)	Late damping off and root rot, dieback, stem blister rust, cankers, twig blight, needle casts and rust, little leaf, wood decay (fungal); blight, stunt, air-pollutants (physiological).	Bark aphid, chermid, shoot moth, sawfly, webworm, scale, miner, spittle bugs, pales weevil, collar weevil, shoot borer, tube moth, bark beetle.
PITTOSPORIUM	Leaf spots, stem and root rots. (fungal)	Scales, aphids mealy bugs.
SYCAMORE (Platanus, occidentalis)	Anthracnose, leaf spots. (fungal)	Aphids, plant but, tussock moth, scales mites, bagworms, whiteflies, borers.

PLANT	DISEASE	INSECT AND OTHER PESTS
POPLAR (Populus)	Cankers, caused by several fungi, branch gall, leaf blister, leaf spots and rusts, powdery mildews and dieback.	Aphids, borer, red-humped caterpillar, tent maker, scales, leaf beetle.
JAPANESE FLOWERING CHERRIES, ETC. (Prunus spp.)	Shot hole (bacterial), leaf spots, black knot, powdery mildews, witches broom (fungal); yellowing (viral).	Aphids, garden beetle, plant hoppers, fruit -worm, pear slug, tent caterpillar, and root nematode.
DOUGLAS FIR (Pseudotsuga, taxifolia)	Cankers, needle cast, twig blight, rust, needle blight.	Aphids, scale.
FIRETHORN (Pyracantha)	Fire blight (bacterial), scab, twig and leaf blight, canker, root rot (fungal).	Aphids, lace bug, scales.
OAK (Quercus)	Anthracnose, basal cankers and other cankers, leaf blister, leaf spots, rust twig blight, wilt, wood decay, root rot.	Galls, scales, caterpillar, sawfly, skeletonizer, oak weevil, gypsy moth, borers, leaf miners, lace bugs, mite.
BLACK LOCUST (Robinia)	Canker, leaf spots, damping-off, wood decay (fungal witches broom (viral).	Borer, leaf miner, carpenterworm, twig borer, scales.
ROSE (Rosa)	Leaf spot, crown gall, hairy rot (bacterial) anthracnose, black spots, blights, powdery-mildews, leaf spots several cankers, wilt, rust (fungal), mosaic, streak (viral), mercury injury (physiological).	Aphids, garden beetle, cane borer, rose chafer, curculio, gall wasp, stem girdler, japanese beetle, leaf hopper, midge, scale, slug, thrip, webworm, 2-spotted mite, nematodes.
WILLOW (Salix)	Twig blight, crown gall (bacterial). leaf blight, cankers, leaf spots, powdery mildews, rust, tar-spots (fungal).	Aphids, leaf beetle, galls, lace bugs, flea beetle, borers, sawfly, scale, caterpillar, bagworm.

PLANT	DISEASE	INSECT AND OTHER PESTS
ELDER (Sambucus)	Cankers, leaf spots, powdery mildews, wilts, blights (fungal);	Borers, flea-beetle, scale, bugs.
SCHEFFLERA	Leaf spots (fungal), leaf drop (physiological).	Root nematodes; spider mite.
MOUNTAIN ASH (Sorbus)	Fire blight, crown gall (bacterial), rust, scab, cankers (fungal).	Aphids, borer, blister mite, japanese leaf hopper, sawfly, scale.
SPIREA	Erwinia (bacterial), leaf spots, cankers (fungal).	Aphids, leaf roller, scales.
LILAC (Syringa)	Blight (bacterial), leaf spots, blights, powdery mildews, wilt, galls (fungal), ring spot, witches broom (viral), frost injury, graft, blight, leaf roll necrosis (physiological).	Borers, caterpillars, scales, beetles, (girdler).
YEW (Taxus)	Needle and twig blight, root-rots (fungal), bark decay, twig browning (physiological).	Black-vine weevil, root-weevil, mealy bugs, scabs, ants, termites and nematodes.
ARBORVITAE (Thuja)	Leaf blight, tip-blight (fungal), leaf browning and shedding, winter browning (physiological).	Aphid, tree borer, leaf miner, mealy bug, scale.
LINDEN (Tilia)	Anthracnose, leaf blight, canker, leaf spots, powdery mildew (fungal).	Aphid, japanese beetle, chewing and cutting insects, bark borer, lace bug, caterpillar, leaf miner, sawfly, scales, mites.
HEMLOCK (Tsuga)	Needle blight, cankers, blister rust, sap-wood rot (fungal) sun scorch, drought injury (physiological).	Borer, looper, leaf miner, scale, mites, bagworm.

PLANT	DISEASE	INSECT AND OTHER PESTS
ELM (Ulmus)	Wet wood (bacterial), Dutch elm disease cankers, leaf curl, leaf spots, powdery mildews, wilts, wood decay (fungal), phloem necrosis, mosaic (viral).	Tussock moth, mite, leaf miner, wooly aphid, elm leaf curl aphid, japanese beetle, elm bark beetle, borers, canker worm, lace bug, gypsy moth.
	Scorch a foliar necrosis due to grafting (Physiological).	
PERIWINKLE (Vinca)	Blight, canker, dieback, leaf spots, root rot (fungal).	Nematodes.
WEIGELA	Gall (bacterial), twig blight, leaf spots, root rot (fungal).	Mealy bug, weevil, scale, cottony cushion, nematode.
WISTERIA	Crown gall (bacterial), leaf spots, cankers, powdery mildews, root rot (fungal), mosaic (viral).	Beetle, mealy bug, vine-weevil, scales.
YUCCA	Leaf blight (fungal).	Mealy bugs, stalk borer, scales, weevil.

WEEDS AMONG ORNAMENTALS, VINES AND TREES

In this metropolitan area weeds should not pose any serious problems. However due to negligence, weeds become a menace and can harbor rats, mice and other small animals.

A weed, by definition, is a plant which is growing in a place where it is not wanted. Weed control in a city as Washington should not warrant the use of chemicals. Most weeds can be controlled by weeding and cultivating.

Annuals:

A. Chickweed: (Stellaria, media) does well in high nitrogen soils. This weed persists in all seasons, produces many seeds and covers the ground like a net.

B. Crabgrass: (Digitaria, spp.) is a summer annual, produces seed in midsummer to early fall and is killed by the first frost.

C. Goosegrass: Silver Crab (Eleusine, indica) stronger than crabgrass in ornamentals. Difficult to remove and tolerant too many weed-killers.

D. Henbit: Member of the mint family, common annual winter weed with square or 4-angled stem, whorled leaves and with clusters of small purple flowers in the leaf axils. This weed likes highly fertile soils.

PERENNIALS

A. Bermuda Grass: Propagates by seeds, stolons, rhizomes. Creeps from ornamentals to turfs.

B. Quackgrass (Agropyron repens) - grass with dull green color spreads by rhizomes but produce seeds.

C. Penny-wort: (Dichondra) member of the morning glory family with running habit and prostrate growth.

D. Nutsedge: Most troublesome. Purple nut - sedge produces tubers. Propagates by vegetative cuttings, seeds and new tubers.

E. Honey-Suckle: (Lonicera) the japanese honeysuckle grows profusely and is a nuisance as it smothers plants, shrubs and small trees. Birds disperse seeds far from the source.

F. Wild Garlic: Spread by bulbs.

G. Poison Ivy: Rhus, radicans is a vigorous climbing vine with clinging roots; leaves are thin, light green, divided into 3 leaflets; flowers are small, inconspicuous clusters. The plant contains a slightly volatile substance which is irritating to the skin of some people. Certain birds feed on the fruit.

VERTEBRATE PESTS

Vertebrate animals may damage ornamentals in several ways. Some (such as mice and moles) feed on roots and crowns. Others (including mice, rabbits, and woodpeckers) feed on stems, trunks, twigs, or foliage.

Barriers, trapping, repellents, and pesticides all help control vertebrate pests. Control of the insects on which vertebrate pests feed is essential.

PHYTOTOXICITY

Phytotoxicity is undersirable injury to plants. Symptoms of phytotoxicity include:

o leaf drop,

o stunting,

o overgrowth,

o discolored foliage,

o leaf curl, and

o stem distortion

The cause of phytotoxicity may be easy to determine or it may be subtle and hidden. Pesticides can cause phytotoxicity. Other causes that create similar symptoms are:

o insects and disease agents,

o insufficient moisture,

o improper fertilization, and

o other adverse growing conditions.

Factors that contribute to pesticide phytotoxicity include:

o high air temperature during and immediately after pesticide application,

o excessive rates of pesticide application,

o too little water,

o uneven distribution of pesticide,

o mixing liquids or emulsifiable concentrates with wettable powders,

o mixing fertilizers with pesticides,

o variety and species differences.

Take special care to avoid injury to landscape plants when using herbicides.

Some herbicides leave residues in spray tanks that will injure desirable plants. Use separate sprayers for herbicides.

ENVIRONMENTAL CONCERNS

To control drift and vaporization:

- o Apply pesticides when wind speeds are low.
- o Use lowest practical operating pressure and largest practical nozzle opening.
- o Keep nozzle as close to target as possible.
- o Avoid using airblast sprayers and dusters when working near sensitive plants and areas inhabited by animals.
- o Do not apply herbicides with airblast sprayers.
- o When possible, select products with low volatility.

To control the adverse effects of pesticide movement:

- o Use special precautions when using pesticides on slopes.
- o Select the least hazardous pesticide that will do the job.
- o Use minmum doses, mulches, and, if possible, maintain a buffer area between the area to be treated and sensitive areas.
- o Consider the chances of heavy rainfall.
- o Regulate the amount and duration of irrigation.
- o Be aware of the potential for ground water contamination.
- o Avoid carrying treated material or the pesticide residue from the target area to adjacent areas.

Applicators must be familiar with the persistence of pesticides they apply to ornamentals especially where:

o adjacent areas may be affected,

o treated soil is used to grow other plants, or

o humans, pets, or other animals are present.

Repeated applications of some pesticides to the same area may cause harmful residues.

Application

Methods of application vary with:

o the kind of pesticide,

o the host, and

o the target pest,

Application equipment must be able to deliver a thorough coverage of the correct amount of pesticide to the plant parts which need protection. Low pressure, low volume sprayers or granular applicators can be used for control of:

o soil pests of ornamentals, or

o weeds.

High pressure hydraulic or airblast sprayers are not often used on ornamentals. You can use them for spraying large trees.

Protecting Animals and People

Keep animals and people away during application, and until spray has dried; or dust has settled. Keep them away from areas of potential drift and runoff. Remove toys, pet food dishes, birdfeeders, and other artiles from the site before applying a pesticide. Do not use pesticides when people or pets cannot be excluded during the re-entry period specified on the label.

for example,

o too little, too much, or imbalanced fertilizer,

o pesticide injury,

o improper planting and pruning,

o root girdling,

o soil conditions (such as improper drainage, compaction),

o mechanical damage (by such things as earth-moving equipment, mowers, and hand tools),

o pollution damage, and

o natural aging of plants (often mistaken for damage caused by insects and diseases).

Symptoms of diseases can be in the form of spots, wilts, blights, blotches, scorches, rots, cankers, galls, rusts, smuts, mildews and many more. One or more agents can produce the same symptoms.

The problem must be diagnosed before using control methods. You must be able to find an insect or recognize the symptoms of a disease.

Literature and Other Materials Cited:

1. KHAN, M. S. 1973 - 1975 — Diseases and Pests of Ornamentals and Shade Trees. Extension Publications. Washington Technical Institute

2. Pathologists and Entomologists — Extension Publications. Virginia Polytechnic Institute and State University; University of Georgia

3. PIRONE, P. Pascal — Diseases and Pests of Ornamental Plants. 4th Edition, Ronald Press Company, New York

4. SHURTLEFF, M. — How to Control Plant Diseases in Home and Garden. The Iowa State University Press, Ames, Iowa

5. WESTCOTT, Cynthia — Plant Disease Handbook, Revised 3rd Edition, Van Nostrand Reinhold Co.